FOREST GLEN SUBDIVISION SUPERFUND SITE
NIAGARA COUNTY, NEW YORK

FIELD SAMPLING PLAN

FOR THE

EAST GILL CREEK, GILL CREEK, AND HYDE PARK LAKE CHARACTERIZATION STUDY

PREPARED FOR

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
7600 SAND POINT WAY NE
SEATTLE, WASHINGTON 98115

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Prepared for

National Oceanic and Atmospheric Administration

Prepared by

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and
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LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	analysis of variance
ASTM	American Society for Testing and Materials
cm	centimeter
COC	chain-of-custody
DDT	dichlorodiphenyltrichloroethane
dioxins/furans	polychlorinated dibenzo-p-dioxins and dibenzofurans
FSP	Field Sampling Plan
M	meter
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRP	Potentially Responsible Party
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TOC	total organic carbon
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

This document is a field sampling plan (FSP) for characterizing the extent and toxicity of contamination in sediment in East Gill Creek, Gill Creek, and Hyde Park Lake downstream of the Forest Glen Subdivision Superfund site in Niagara, New York. This plan includes the objectives, rationale, and goals for the characterization project.

1.1 Site Description and Background

The Forest Glen Subdivision Superfund site is located in the City of Niagara Falls, New York and the Town of Niagara, New York (Figure 1). The site is approximately 39 acres, including an 11-acre former mobile home subdivision. Originally the site was primarily a wooded wetland. In the 1960s the land was cleared and in the 1970s low-lying areas were filled and the mobile home subdivision was developed. Illegal dumping of industrial waste occurred at the site from the 1950s through the 1970s. Soils on the site are contaminated with polycyclic aromatic hydrocarbons (PAHs) and other semi-volatile organic compounds (SVOCs).

In the 1980s, the Niagara County Health Department and the New York State Department of Environmental Conservation requested that U.S. Environmental Protection Agency (USEPA) include the site on the National Priorities List (NPL). Four Potentially Responsible Parties (PRPs) were involved in the remediation: Goodyear Tire and Rubber Company, Niagara Falls USA Camp Site, Inc., and two citizens. Between 1990 and 1992, 153 people were permanently relocated from the site.

In 2001, Goodyear reached a settlement with USEPA and natural resource trustees to resolve liability at the site in exchange for a remediation of the site, restoration of injured resources, and associated past costs. As a trustee for natural resources, the National Oceanic and Atmospheric Administration (NOAA) issued a provisional covenant not to sue with the stipulation that additional sampling was needed to adequately characterize contamination downstream of the site. As part of the settlement, NOAA received support to conduct this sampling.

1.2 Report Organization

This document is organized into four sections. Section 2.0 presents the objectives, rationale, and goals of the characterization program, the types of data that are to be collected, and the uses of those data. Section 2 also describes the study design of the characterization program. Section 3.0 describes the stations, field activities, laboratory tests, and chemical analyses. Section 4.0 describes the reporting and statistical approach proposed for data analysis.

2.0 CHARACTERIZATION PROGRAM

The overall purpose of the proposed characterization program is to verify that toxic substances from the Forest Glen site have not migrated downstream of the site and are not posing risk to ecological receptors. Sampling to collect sediment samples for laboratory bioassays and chemical analyses will take place during the week of September 12, 2005.

The characterization program will measure contaminant concentrations in sediment in East Gill Creek, Gill Creek, and Hyde Park Lake. Sediment will also be collected to conduct laboratory toxicity bioassays using the benthic organisms *Hyalella azteca* and *Chironomus tentans*. A sediment bioaccumulation study will be conducted in the laboratory using *Lumbriculus variegatus*. It is expected that the sampling event will require 3-5 days in the field. Findings from the chemistry analyses, toxicity tests, and the bioaccumulation study will be used to determine whether or not contaminants have migrated downstream of the site and whether they pose a threat to NOAA trust resources.

2.1 Rationale for Study Design/Study Objectives

A characterization study for East Gill Creek, Gill Creek, and Hyde Park Lake is necessary to ensure that contamination from the Forest Glen Subdivision Superfund Site has not migrated downstream. Sampling in East Gill Creek will address the potential for contaminant migration and retention in sediment directly downstream of the site. Gill Creek sampling will provide an indication of other potential sources of contaminants to Hyde Park Lake as well as an evaluation of whether any contaminants may have migrated via the wetland at the Superfund site. Sampling in Hyde Park Lake will focus on depositional areas (e.g. sediments behind the dam) that may have accumulated contaminants from the site. The synthesis of the sediment chemistry data from these three reaches will allow a more comprehensive understanding of the spatial extent of contamination from the Forest Glen Subdivision Superfund Site.

Laboratory toxicity and bioaccumulation testing will be conducted using site-specific sediments and will provide information on the potential toxicity of contaminant mixtures in the sediment. These tests will also address the bioavailability of the contaminants. The laboratory setting will allow many of the variables (light, temperature, dissolved oxygen, etc.) to be closely controlled.

The two laboratory toxicity test species, *Hyalella azteca* and *Chironomus tentans*, have been extensively used for sediment toxicity testing. As such, there is a large database of known contaminant effects for these species. These two species also represent two different exposure scenarios. *Hyalella azteca* is an epibenthic species that tends to ingest sediments along with algae and bacteria. *Chironomus tentans* is an infaunal species that burrows in the top few inches of the sediments. The benthic community is a vital component of a functioning ecosystem as it serves as a prey base for higher trophic levels and as a part of the nutrient cycle.

The bioaccumulation study will be conducted to evaluate the potential for bioaccumulating contaminants to transfer from the sediments to the food web. The freshwater oligochaete, *Lumbriculus variegatus*, will be used to assess bioaccumulation of site sediments in a laboratory setting. Laboratory bioaccumulation tests using *Lumbriculus variegatus* can be extrapolated to the field with a reasonable degree of certainty for dichlorodiphenyltrichloroethane (DDT), PAHs, polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins/furans) (Oliver, 1987; Ankley et al., 1992; Brunson et al., 1998; Lyttikainen et al., 2003; Ingersoll et al., 2003).

2.2 Program Objectives

The specific objectives of the proposed program are to: 1) document whether contaminants from the Forest Glen Site have migrated downstream to East Gill Creek, Gill Creek, and Hyde Park Lake, 2) determine whether the sediments are toxic to benthic organisms, and 3) determine whether contaminants can bioaccumulate. The proposed approach to address each of these program objectives is as follows:

- *What are the sediment concentrations of contaminants of concern in East Gill Creek, Gill Creek, and Hyde Park Lake, areas that may have received migrating contamination from the Forest Glen Superfund Site?* This question will be evaluated by sampling sediment from East Gill Creek, Gill Creek, and Hyde Park Lake. Samples will be analyzed for contaminants of concern as well as physical characteristics.

- *Are bulk sediments from East Gill Creek, Gill Creek, and Hyde Park Lake, toxic to benthic organisms?* This question will be evaluated by conducting bulk sediment toxicity bioassays in a laboratory. Two species will be used: the amphipod, *Hyalella azteca,* and

the midge, *Chironomus tentans*. If a significant difference is found between the treatments and the controls, it will be assumed that the sediments are toxic to these organisms.

- *Do contaminants in East Gill Creek, Gill Creek, and Hyde Park Lake bioaccumulate?* This question will be addressed by conducting a laboratory bioaccumulation study using *Lumbriculus variegatus* exposed to sediments from the site. If bioaccumulative contaminants are available, the tissues will show elevated contaminant concentrations relative to the control following exposure to the test sediments. Additionally, growth will be measured as a toxicity endpoint.

This study is not designed to assess all acute and chronic aquatic toxicity endpoints. Therefore, lack of effects demonstrated by this study does not preclude the potential for reproductive or other physiological effects.

3.0 STUDY DESIGN

A characterization program consistent with the purpose and objectives outlined in Sections 2.1 and 2.2 has been designed to assess the extent of contamination in the assessment area and the potential for those contaminants to accumulate in or adversely affect ecological receptors. The characterization program has three components: 1) analysis of sediments for concentrations of contaminants and selected physiochemical parameters, 2) an evaluation of sediment toxicity using laboratory toxicity assays with *Hyalella azteca* and *Chironomus tentans*, and 3) an evaluation of uptake of contaminants and growth effects in the laboratory using *Lumbriculus variegatus*. The design for each component will be based on the USEPA methods listed in Table 2.

NOAA will coordinate and conduct the sediment sampling. Analytical Resources, Inc. (ARI) will perform the metals, PAH, pesticide, and PCB analyses; Axys Analytical Services Ltd. (Axys) will perform the dioxin/furan analysis; and EVS Environment Consultants Limited (EVS) will perform the bioassay testing.

3.1 Scheduling

Samples of sediment will be collected the week of September 12, 2005. Approximately three to five days are required for field sampling. Sediment will be shipped for overnight delivery to the laboratories for analysis.

3.2 Station Locations

East Gill Creek flows through the Forest Glen Subdivision Superfund Site before it enters a culvert to flow under railroad tracks that serve as the site boundary. Sampling in East Gill Creek will include six locations from the culvert outlet downstream to the outflow into Hyde Park Lake. Since contaminants may have migrated to Gill Creek via the wetlands on and adjacent to the site, sampling will occur at three locations in Gill Creek from the northern extent of the site downstream to Hyde Park Lake. Sampling in Hyde Park Lake will include nine locations and will focus on depositional areas, including the sediments located behind the dam. Water depth at each station is anticipated to be between 0.3 meters (m) and 1 m in East Gill Creek and Gill Creek and between 2 m and 3 m in Hyde Park Lake. Horizontal coordinates of the sample stations will be positioned with a GPS unit. The accuracy of the GPS unit is 15 m in

autonomous collection mode (no DGPS), or 3-5 meters using a Continuously Operating Reference Stations (CORS) or <3 meters using the Wide Area Augmentation System (WAAS) for real-time differential corrections. The accuracy of the GPS unit will depend on the availability of signal. In addition to the test stations, one sample will be collected from both East Gill Creek and from Gill Creek at locations upstream of possible site influence. Sampling locations are shown on Figure 1.

3.3 Sediment Sampling

Sediment samples will be collected at each of the 18 stations: nine in Hyde Park Lake, six in East Gill Creek, and three in Gill Creek. Samples in Hyde Park Lake will be collected from a boat. Samples in the creeks will be collected by wading. A duplicate sample will be collected at two stations, to be selected in the field. Samples will be collected using a "petit Ponar" grab (dredge), which is capable of a penetration depth of 10 cm. Replicate grabs will be collected, as closely spaced as possible, to obtain the necessary sample volume (Table 1). Overlying water will be siphoned from the grab sample and all sediment retained will be placed directly in a clean stainless steel bowl and homogenized with a stainless steel spoon. Aliquots of sediment will then be transferred to the appropriate sample containers (Table 1). General sampling procedures are discussed in the following section.

Table 1. Analytical Methods, Containers, Preservation, and Holding Times for Sediment Sampling

Analyte	Method	Sampling Container Type	Number of Samples	Size	Preservation	Holding Time (days)	
						Prep	Analysis
Chemical Analyses (Sediment)							
TAL Metals	USEPA 6010B/200.8/7471A (ICP, GFAA, CVAA)	G/p	20	4 oz.	4° C	–	28/180[a]
PAHs	USEPA 8270D-SIM (GC/MS)	G/p	20	16 oz.[c]	4° C[c]	14	40[b]
Chlorinated Pesticides and PCBs	USEPA 8081A/8082 (GC/ECD)						
Dioxins/Furans	USEPA 1613B (HRGC/HRMS)	G/p	20	8 oz.	4° C	30	45[b]
Chemical Analyses (Rinsates)							
TAL Metals	USEPA 6010B/200.8/7470A (ICP, CVAA)	HDPE	2	1 L	4°C, HNO_3 to pH<3	–	28/180[a]
PAHs	USEPA 8270D-SIM (GC/MS)	AG	2	1 L[c]	4° C[c]	7	40[b]
Chlorinated Pesticides and PCBs	USEPA 8081A/8082 (GC/ECD)						
Dioxins/Furans	USEPA 1613B (HRGC/HRMS)	G/p	2	8 oz.	4° C	30	45[b]
Conventional Analyses (Sediment)							
Total Organic Carbon	Plumb 1981	G/p	20	4 oz.	4° C	–	14
Moisture content	ASTM D2216-90	G/p	20		4° C	–	180
Grain size	ASTM D422	HDPE	20	16 oz.	4° C	–	180

Notes:
– Not applicable
[a] 28 days for mercury; 180 days for other metals
[b] After extraction
[c] Sample volume for pesticides/PCBs is included in the sample container specified for PAHs.
AG = amber glass
CVAA = cold vapor atomic absorption
G/p = glass jar with polytetrafluoroethylene (Teflon) -faced liner in lid
GC/ECD = gas chromatography/electron capture detector
GC/MS = gas chromatography/mass spectrometry
GFAA = graphite furnace atomic absorption
HDPE = high density polyethylene
HRGC/HRMS = high-resolution gas chromatography/high-resolution mass spectrometry
ICP = inductively coupled plasma

Table 2. Analytical Methods, Containers, Preservation, and Holding Times for Biological Sampling

Analyte	Method	Sampling Container Type	Number Of Samples	Size	Preservation	Hold. Time (days)	
						Prep.	Analysis
Biological Analyses							
10-day *Chironomus tentans* sed. toxicity	USEPA 2000 100.2	G/p	10	4 L	4°C	–	56
10-day *Hyalella azteca* sediment toxicity	USEPA 2000 100.1						
4-day *Lumbriculus variegatus* screening	USEPA 2000 100.3	G/p	3	12 L	4°C	–	56
28-day *Lumbriculus variegatus* bioaccumul.							
Chemical Analyses (Post-bioassay tissue)							
TAL Metals	USEPA 6010B/7000A/7471 A (ICP, GFAA, CVAA)	–	3	–	Frozen	–	–
PAHs	USEPA 8270C (GC/MS)	–	3	–	Frozen	–	–
Chlorinated Pesticides and PCBs	USEPA 8081A/8082 (GC/ECD)						
Dioxins/Furans	USEPA 1613B (HRGC/HRMS)	–	3	–	Frozen	–	–
Conventional Analyses (Post-bioassay tissue)							
Lipid content	Bligh & Dyer mod.	G/p	3	–	Frozen	–	360

Notes:
– Not applicable
CVAA = cold vapor atomic absorption
G/p = glass jar with polytetrafluoroethylene (Teflon) -faced liner in lid
GC/ECD = gas chromatography/electron capture detector
GC/MS = gas chromatography/mass spectrometry
GFAA = graphite furnace atomic absorption
HRGC/HRMS = high-resolution gas chromatography/high-resolution mass spectrometry
ICP/MS = inductively coupled plasma-mass spectroscopy

3.4 General Sampling Procedures

Sampling locations. The location of each sample collected will be determined with a handheld GPS unit and recorded in field notebooks. For backup, the location will also be noted on a sketch of the site or a GIS base map developed for the sampling.

In-field measurements. Weather and general conditions of the streams, including estimated width, depth, flow, bottom characteristics, and surrounding habitat will be noted in the field notebooks at each sampling location.

Sampling protocol: The following sampling protocol will be used when sampling from a shallow location reached by wading or when sampling from a boat:

1. Measure and record water depth with a weighted measuring tape.
2. Remove the straight (locking) bolt from the sampler, place Ponar into its open position and insert the spring-loaded bolt into the assembly.
3. Lift the Ponar sampler into a vertical position and slowly lower the sampler to a point approximately two inches above the sediment.
4. Drop the sampler to the sediment. Slack on the line will release the trip bar or spring loaded pin; pull up sharply on the line closing the dredge.
5. Raise the Ponar above the sediment surface and slowly decant any free liquid through the screens on top of the dredge. Care should be taken to retain the fine sediment fraction during this operation.
6. Place a stainless steel container under the Ponar sampler and lower the sampler into the stainless steel container.
7. Press down on hinge arms to open the sampler and discharge the sediment sample to the container. If necessary, continue to collect additional sediment with replicate grabs until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested.
8. Replace straight (locking) bolt into the Ponar sampler and set aside.
9. Handle and subsample the sediment sample as described below and in the QAPP.
10. Wash the sampler, bowl, spoons, deck, and other equipment according to the decontamination procedures in Section 3.8.5.

Sample packaging. Sediment samples for chemical analysis, bioassay, and bioaccumulation testing will be placed into appropriate, pre-cleaned glass jars (Tables 1 and 2).

Sample labeling. All samples will be labeled in the field. The sampling team will use indelible black ink on all sample labels. The plastic bags will be labeled by inserting a label between the inner and outer plastic bag. Each sample will be assigned a unique sample number using the following format:

SC-mm

where,

SC = Site Code
mm = Individual station number, a unique sequential number assigned to the stations within the reach

The site codes will be:
EG = East Gill Creek
GC = Gill Creek
HP = Hyde Park Lake

For example, "EG-02" would be assigned to a sediment sample collected from Station 02 in East Gill Creek.

Sample shipping. When all samples have been collected, the samples will be placed in coolers with sufficient blue ice to maintain a temperature of 4°C +/- 2°C. Each sample will be wrapped in bubble wrap and double bagged in resealable plastic bags. Additional bubble wrap will be added as needed to ensure the samples are secure in the cooler. The samples for bioassay and bioaccumulation testing will be packed in separate coolers. The completed chain-of-custody forms will be placed in plastic bags and taped to the inside of the cooler lids. The coolers will be sent via overnight delivery directly to the laboratories. Airbill and shipment tracking information will be retained and sent to the laboratories. In addition, prior notice and arrangements will be made if the samples will be delivered on the weekend. The coolers will be shipped to the following individuals:

Chemical analyses other than dioxins and furans:

Mary Lou Fox, Project Manager
Analytical Resources, Inc. (ARI)
4611 S. 134th Place
Seattle, WA 98168-3240
Phone: 206-695-6200
Fax: 206-695-6201
E-mail: marylou@arilabs.com

Dioxin and furan analyses:

Mary Lou Hendry, Project Manager
Axys Analytical Services, Ltd.(Axys)
2045 Mills Road
PO Box 2219
Sidney, BC V8L 3S8
Phone: 250-655-5800 or 888-373-0881
Fax: 205-655-5811
E-mail: mhendry@axys.com

Bioassays:

Edmund Canaria, Laboratory Manager, Toxicology Services
EVS Environment Consultants Limited
195 Pemberton Avenue
North Vancouver, B.C. V7P 2R4
Canada
Phone: 604-986-4331

3.5 Chemical Analyses

The analyses to be performed on the sediment samples are:

- USEPA Target Analyte List (TAL) metals
- Selected semivolatile organic compounds
- Organochlorine pesticides

- PCBs (as Aroclors)
- Dioxins/furans
- Total organic carbon (TOC),
- Grain size
- Percent moisture

The specific substances, analytical methods, and method detection and reporting limits are presented in the QA Plan. Sediment volumes required are indicated in Table 1.

3.6 Laboratory Toxicity Assays

Sediment bioassays will be performed on site sediment with the organisms *Hyalella azteca* and *Chironomus tentans* according to USEPA (2000) test methods. Every attempt should be made to test this sediment within 14 days. The maximum holding time for this test protocol is 8 weeks.

A 10-day whole-sediment static renewal toxicity test will be performed for each sample and each test species. Each sample will be tested using nine replicates (eight for toxicity and one for water quality). Ten *Hyalella azteca* or ten *Chironomus tentans* will be placed in each test chamber. Test organisms will be fed daily for the duration of the test. Chambers will experience a controlled testing environment at 23 ± 1° C with a 16:8 hour light:dark photoperiod. If dissolved oxygen in the chamber is below 2.5 mg/L, chambers will be aerated at a gradual rate making sure that the sediment surface is not disturbed. Water hardness, alkalinity, conductivity, pH, and ammonia will be measured at the start and end of the test. Dissolved oxygen and temperature will be measured daily.

At the end of the test survival and growth endpoints will be assessed.

3.7 Bioaccumulation Study

3.7.1 4-d Screening Test

Testing will follow USEPA (2000) guidelines. The organisms will be exposed to sediments for 4 days in a static-renewal system as part of the preliminary screening test. In this screening test, each sample will be tested using 4 replicates and ten organisms will be added to each replicate.

All the test treatments will receive two water changes daily throughout the duration of the test. Temperature, pH, dissolved oxygen (DO), conductivity, hardness, alkalinity and ammonia will be measured in the overlying water at the start and end of the test; and temperature and DO are measured daily. A concurrent reference toxicant test will also be conducted to assess the health and sensitivity of the organisms used in the toxicity tests.

The *L. variegatus* will be exposed to the test sediments at 23 ± 1 °C under a 16:8 (light:dark) photoperiod. The organisms will not be fed and no aeration will be provided during the test unless the DO falls below 2.5 mg/L, then gentle aeration will be provided for the duration of the toxicity test. At the end of testing, organisms will be sieved from the sediments and survival will be determined. Validity of the screening test will be based on performance-based criteria presented in Table 13.4 of USEPA (2000).

3.7.2 28-d Bioaccumulation Test

Testing will be conducted according to USEPA (2000) guidelines. The organisms will be exposed to sediments for 28 days in a static-renewal system. Each sample will be tested using at least 5 replicates (four for toxicity and one for water quality). The overlying water will be renewed twice daily throughout the duration of the test. Temperature, pH, dissolved oxygen (DO), conductivity, hardness, alkalinity and ammonia are measured in the overlying water on Days 0 and 28; and temperature and DO will be measured daily. A concurrent reference toxicant test will also be conducted to assess the health and sensitivity of the organisms used in the toxicity tests.

The bioaccumulation test will be conducted at 23 ± 1 °C under a 16:8 (light:dark) photoperiod. The organisms will not be fed and no aeration will be provided during the test. Aeration will only be provided if the DO falls below 2.5 mg/L. At test termination, organisms will be sieved from the sediments and survival will be determined. The wet weight of the survivors are then measured. Validity of the bioaccumulation test will be based on performance-based criteria presented in Table 13.4 of US EPA (2000).

Organisms are held in clean water for 6 to 8 h (not to exceed 24 h) after separating them from the sediment to allow purging their guts of any sediment. Aeration will be provided to holding

vessels during this process. The organisms will then be collected for analysis of bioaccumulated concentrations of analytes.

The specific substances to be measured would be determined based on the results of the analyses of the sediment samples, but the analyses are expected to include selected metals, PAHs, PCBs, and dioxins/furans or a subset of these analytical groups. Lipid content of the tissues will be measured. Analytical methods are indicated in Table 2. Detection limits for each analyte are provided in the QAPP.

3.8 Quality Assurance/Quality Control Procedures

The quality assurance/quality control (QA/QC) requirements are discussed in detail in the QAPP. This section briefly describes how the field QC samples will be collected and the quality assurance review that will be provided by the analytical laboratories.

3.8.1 Equipment Rinsate Blanks

Two rinsate blanks will be collected from the sampling equipment used at the site. After the sampling equipment has been decontaminated, distilled water will poured over or into the equipment. The rinsate will be captured in the appropriate container (Table 1). The rinsate samples will be analyzed for the same parameters as the corresponding field samples.

3.8.2 Field Duplicate Samples

Two field duplicate samples will be collected at the site, as described in section 3.3; locations will be determined based on field conditions (e.g., ease of obtaining enough material). The duplicate samples will be collected from the same homogenized material as the corresponding field sample and will be submitted blind to the laboratory for the same analyses as the corresponding field samples.

3.8.3 MS/MSD Samples

Sufficient sample material will be collected during the sampling activities to allow for analysis of matrix spike/matrix spike duplicate (MS/MSD) samples at a frequency of one MS/MSD for

every 20 field samples collected. The field samples intended for MS/MSD analysis will be designated in the field and identified on the chain-of-custody document. Preferably, the MS/MSD sample will be from the same sample location as an associated field replicate. The MS/MSD sample will be analyzed for the same parameters as the associated field samples and will be part of the same analytical batch.

3.8.4 Laboratory QA/QC

Prior to being released to NOAA, the chemistry data will undergo an internal quality assurance review at the laboratory. The laboratory quality control samples will consist of method blanks, laboratory control samples, matrix spikes and matrix spike duplicates, and calibration check standards for metals analyses. For the toxicity and bioaccumulation assays the laboratory will confirm that the control and reference sample survival rates are greater than 80 percent.

3.8.5 Decontamination Procedures

To minimize the potential for cross-contamination of samples, equipment used during sampling activities will be decontaminated prior to use at each sampling site. Personnel who may contact sample media will wear nitrile gloves. Prior to sample handling, new gloves will be donned; gloves will be changed between each unique sampling event. Decontamination will be conducted on plastic sheeting. Work surfaces will be covered with aluminum foil. The sampling and mixing equipment (Ponar dredge, bowls, spoons, and spatulas) will be decontaminated after sampling at each sample location:

1. Wash with site water and phosphate-free detergent, if necessary to remove all visible residues.
2. Rinse with site water.
3. Rinse with distilled water and allow to air dry.

The homogenization bowls and spoons will be decontaminated by:

1. Washing with site water and phosphate-free detergent.
2. Rinse with site water.
3. Rinse with distilled water and allow to air dry.
4. Rinse with reagent grade methanol.
5. Rinse with distilled water and allow to air dry.
6. Cover with aluminum foil until used again.

Decontamination fluids other than rinse methanol will be returned to the water body. Rinse methanol will be collected and transported to a laboratory for proper disposal.

3.8.6 Documentation

Thorough recordkeeping is the most important aspect of sample custody. A field notebook will be maintained throughout the sampling effort and will contain information for each station occupied and each sample taken. It will have numbered pages, and the recorder will initial each entry. The field notebook will be organized by date and will include the station number, notes on sampling crew and weather, any sampling problems, deviations from the work plan, and general observations and comments.

Each sample will be recorded on a chain-of custody (COC) form. The COC form will identify the project, sampling crew, sample number, date and time of collection, and analyses to be performed. COC forms would be completed in triplicate; the person responsible for sample collection will retain one copy, and the other two copies will accompany the shipment to the laboratory. The COC forms must be signed by the recipient and the individual relinquishing the samples at each point where custody of the samples is transferred. All field notebook and COC entries will be made in indelible ink.

4.0 DATA ANALYSIS

Due to the limited sample size, statistical analyses may not be appropriate for each data set. For each reach (Hyde Park Lake, East Gill Creek, and Gill Creek), data may be pooled to explore reach-wide differences rather than station-specific differences. In addition, the data will be examined for concentration gradients away from the site.

4.1 Sediment Data

Due to the limited sampling locations and replicates, statistical analyses will not be performed on sediment data. Organic sediment chemistry results will be normalized to the TOC content. Analytical results will be used to qualitatively identify areas with contaminant concentrations that are above sediment screening criteria (found in the QAPP).

4.2 Toxicity Data

Reference and station locations will be compared using an analysis of variance (ANOVA). The eight replicates per station location will be averaged.

Prior to statistical analysis, the data will be evaluated to ensure that they meet the assumptions of the ANOVA (i.e., normality and homogeneity of variances). Shapiro-Wilk's test will be used to test for normality. If data do not meet the assumptions of the statistical tests, appropriate transformations will be used. If transformed data still do not meet the assumptions for a parametric test, appropriate non-parametric test will be used.

4.3 Bioaccumulation Data

The bioaccumulation study will measure growth (as wet weight) and tissue contaminant concentration. Tissue chemistry results will be normalized using the mean percent lipid for each replicate. Stations will be compared to controls and reference using an ANOVA if the assumptions of normality are met. Prior to analysis, the data will be evaluated to ensure that they meet the assumptions of the statistical tests (i.e., approximate normality and homogeneity of variances for the ANOVA and Scheffe's tests). This evaluation will be performed using boxplots, normal probability plots, and other graphical diagnostic procedures. For those data

that appear to violate the assumptions of the statistical tests, appropriate transformations will be used.

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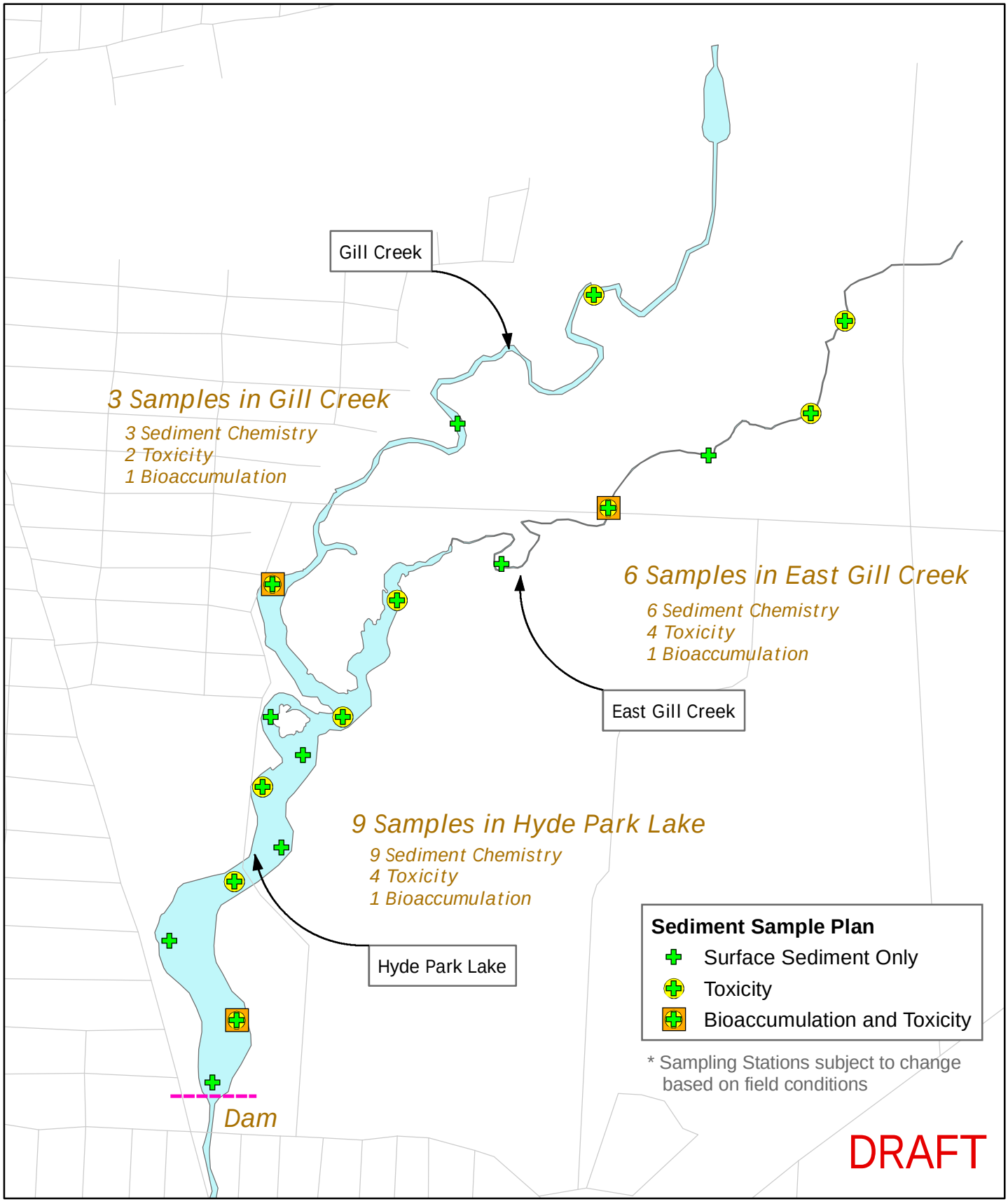
FIGURES



NOTES
Coordinate System & Grid:
UTM Zone 18 Meters NAD83
Orthophoto: NYGIS 2002
Hydrology digitized by NOAA CPRD based on DRG, DOQQ
Sediment Chemistry at all locations
Bioaccumulation will be co-located with toxicity

0 250 500 Meters
0 1,000 2,000 Feet

FIGURE 1. FOREST GLEN SEDIMENT SAMPLING PLAN

NOAA CPRD: BDS 09/07/2005
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